XIV.

ON A MECHANICAL ATTACHMENT FOR EQUATORIAL MOUNTINGS, TO FACILITATE SWEEPING IN RIGHT ASCENSION.

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Not infrequently it happens that the astronomer has occasion to search a portion of the heavens defined in right ascension and north polar distance. The general method of such searches consists in a subdivision of the entire area into a number of zones, — of a convenient length in right ascension and of a width in declination somewhat less than the field of view of the eye-piece. No special difficulty attaches to the mere shifting from one zone to another in declination: this may be done quite automatically by a known amount of rotation of a tangent-screw applied to the declination-circle; or the observer, watching some star that happens to be in the right part of the field, can turn the tangent-screw until the instrument points upon the new zone.

To define the limits of the several zones in right ascension, however, is not so simple a matter. If it is not important that the limits of the zones be accurately observed, and neighboring stars are readily visible, perhaps the observer may get along fairly well by simple eye-alignment. Or, if he has an assistant at the right-ascension-circle, he can be duly apprised of the termination of the zones. Or, each sweep in right ascension may be terminated quite at random, the telescope being moved so far each time that the entire zone shall be surely covered: there must, nevertheless, be frequent reference to the clock and circle.

All of these methods take a deal more time than is employed in the actual search at the eye-piece. If, without leaving the eye-piece, the observer had some convenient way of knowing the moment when his telescope had reached the end of the zone, much of his time would be

saved, and the search could be prosecuted with greater rapidity. In the autumn of 1877, I devised for this purpose the piece of mechanism which I am about to describe.

In sweeping over the zones in right ascension, the clock-motion and sector are, of course, detached from the polar axis. The arc of the sector is to be graduated, as the right-ascension-circle is graduated; it need be only a continuous graduation of hours and parts thereof. Sliding upon this graduation, or adjacent to it, are two metallic vernier-like pieces, both of which are furnished with screws for clamping to any part of the graduated sector-arc. Each of these verniers carries a projecting metallic point, attached to it on a line joining the centre of the polar axis and the zero point of the vernier. Revolving freely about the polar axis, and adjacent to the sector, is a collar, carrying a projecting arm the end of which will just touch the metallic points attached to the verniers. This collar has a screw for clamping it to the polar axis, just as the sector has. And, moreover, electric apparatus is so disposed that, whenever the end of the projecting arm comes in contact with either of the metallic points attached to the verniers, a telegraphic sounder shall beat, or an electric bell shall ring.

The apparatus is now complete. Its use is as follows: —

By means of the graduation on the sector, the two verniers contiguous to it are set at a distance apart equal to the length of the zones to be searched. The sector is then unclamped from the polar axis and connected with the clock, and the clock set a-going. The telescope is then set to the right ascension of one end of the zones to be searched, and the projecting arm is at the same time brought into contact with the metallic point of the corresponding vernier, and clamped to the polar axis in that position. After the declination-circle is set, the whole instrument is ready for the search, and it is not necessary to remove the eye from the telescope, as the click of the sounder or the ring of the bell apprises the ear of the observer whenever the telescope reaches either limit of the zone in right ascension.

I venture to predict the usefulness of this piece of apparatus in the search for intramercurial planets during total solar eclipses, when the available time is a minimum, and the area to be swept over is comparatively quite extended. I hope, also, for its successful application in orbit-sweeping; it was in connection with the execution of such a search that the apparatus was devised. Furthermore, in the event of search for an object so faint as to require a very large telescope, I

think the device will be found of especial utility; as, in the case of cumbrous mountings, the ingenious modification of an equatorial into an orbit-sweeper, suggested by Sir George Airy, does not appear to be convenient in application. If the orbit is somewhat inclined to the equator, it will be found convenient to stop the equatorial clock for a few seconds after a given space in declination has been passed over. A new system of zones is then begun.

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